

1. What does the designation “Pt100” signify for a platinum temperature sensor?
 - A. It has a resistance of 100 Ω at 0 °C.
 - B. It has a resistance of 100 Ω at 100 °C.
 - C. Its resistance changes by 100 Ω per 1 °C change.
 - D. It can operate accurately only up to 100 °C.

2. An LVDT operates based on which fundamental principle?
 - A. Piezoelectric effect
 - B. Mutual inductance
 - C. Piezoresistivity
 - D. Hall effect

3. When the core of an LVDT is exactly at its central (null) position, the output voltage is ideally:
 - A. Zero volts
 - B. Maximum positive
 - C. Maximum negative
 - D. Constant positive offset voltage

4. To detect heel-strike and toe-off separately during walking, two Force-Sensitive Resistors (FSRs) placed under the toe and heel should be:
 - A. Measured individually (two separate channels)
 - B. Connected in series
 - C. Connected in parallel
 - D. Averaged in a single measurement circuit

5. Which of the following is a major source of error or noise unique to DC magnetic blood flowmeters?
 - A. Steady half-cell potentials at the blood–electrode interface (electrode polarization)
 - B. Transformer-induced voltages from the changing magnetic field
 - C. Ambient 50/60 Hz electromagnetic interference in the laboratory
 - D. Internal thermal noise in the blood due to its temperature

6. What type of blood flow measurement can a magnetic flowmeter provide that highlights its utility in hemodynamic monitoring?
 - A. Instantaneous, pulsatile flow waveforms (continuous real-time blood flow velocity)
 - B. Only the average flow volume over a 24-hour period (no real-time detail)
 - C. Only very slow changes in flow (unable to capture pulsatile dynamics)
 - D. It cannot directly measure blood flow at all in real time

7. Which of the following system **can** provide invasive heart rate measurement:
 - A. Tonometry
 - B. DC magnetic flowmeter
 - C. Thorax Impedance plethysmography
 - D. none of the above

8. In quiet standing, what is the relationship between a person's center of pressure (CoP) and center of mass (COM)?
- A. The CoP is an active control variable that shifts around the COM's projection to stabilize balance
 - B. The CoP always coincides exactly with the COM projection on the ground.
 - C. The COM is actively moved to keep up with the CoP (the CoP is passive).
 - D. The CoP and COM positions are unrelated during standing balance.
9. An electromagnetic flowmeter measures:
- A. Heart rate
 - B. Blood velocity
 - C. Saturation of carbon dioxide
 - D. All of the above
10. Fluid dynamics can be modeled with electrical circuit components where:
- A. Fluid resistance is modeled by resistance
 - B. Fluid inertia is modeled by capacitance
 - C. Fluid volume is modeled by voltage
 - D. Fluid flow is modeled by charge

Correct answers:

- 1. **A.** It has a resistance of $100\ \Omega$ at $0\ ^\circ\text{C}$
- 2. **B.** Mutual inductance
- 3. **A.** Zero volts
- 4. **A.** Measured individually (two separate channels)
- 5. **A.** In DC flowmeters, the electrodes in contact with blood develop DC offset voltages (half-cell potentials) and polarization effects that can overwhelm the small flow signals. This issue is much less in AC systems since the field isn't constant. (Option B refers to AC interference; C and D are not the distinctive limiting noise for DC magnetic flow measurements.)
- 6. **A.** Electromagnetic flowmeters can measure the instantaneous pulsatile flow in arteries on a beat-by-beat basis. Their fast electrical response allows tracking of the blood flow waveform (e.g. each pulse of the cardiac cycle), rather than just an average value. (They are not limited to long-term averages or only slow changes—options B and C are incorrect, and option D is plainly false.)
- 7. **D.**
- 8. **A.** The CoP is an active control variable that shifts around the COM's projection to stabilize balance.
- 9. **B.**
- 10. **A.**